

### CLAIMS

What is claimed is:

1. A process for the preparation of pentafluoroethane, comprising:
  - (a) contacting a mixture comprising hydrogen fluoride and at least one one starting material selected from haloethanes of the formula  $CX_3CHX_2$  and haloethenes of the formula  $CX_2=CHX$ , where each X is independently selected from the group consisting of F and Cl provided that no more than four of X are F, with a fluorination catalyst in a reaction zone to produce a product mixture comprising HF, HCl, pentafluoroethane, underfluorinated halogenated hydrocarbon intermediates and less than 0.2 mole percent chloropentafluoroethane based on the total moles of halogenated hydrocarbons in the product mixture;
- wherein said fluorination catalyst comprises at least one chromium-containing component selected from (i) a crystalline cobalt-substituted alpha-chromium oxide where from about 0.05 atom % to about 6 atom % of the chromium atoms in the alpha-chromium oxide lattice are replaced by trivalent cobalt, and (ii) a fluorinated crystalline oxide of (i).
2. The process of Claim 1 further comprising
  - (b) separating the product of step (a) to recover  $CF_3CHF_2$  as a product and to obtain underfluorinated halogenated hydrocarbon intermediates; and
  - (c) returning underfluorinated halogenated hydrocarbon intermediates obtained in step (b) back to the step (a) reaction zone;